Grommet

The invention relates to an grommet of plastic material according to the preamble of claim 1.

Expandable nuts or so-called grommets of a plastic material have become known in most varied designs. Commonly, they are snappingly inserted into the opening of a sheet-like support by means of a shank. The shank has snapping means to retain the grommet in the opening. Furthermore, the grommet has a flange-like head which sealingly comes to bear against the side of the support that faces it when the shank has been snappingly seated in the opening. The head frequently has a flange-shaped portion of another plastic material which is softer than that of the shank and has a better sealing effect. The shank has an inner axial receiving bore into which a member having a male thread can be screwed to fix another member to the support.

The receiving holes in the support member frequently are of a square shape. Accordingly, the shank is also of a square shape in cross-section. In this context, it has also become known to provide shoulders at the outside of the shank at least on diagonally opposed sides close to the head. The shank and the receiving opening are profiled and dimensioned so as to allow to rotate the shank about a certain angle. As a result, the surface of the shoulders gets under the support member on the side opposing the head so that it is no longer possible to draw the shank out of the opening. At this stage, the surface portions above the shoulders cooperate with the edge of the opening to clampingly retain the grommet in the rotated position in the receiving opening.

Naturally, the sheet of the support member is with tolerances. In addition, the support members are of different thicknesses which depend on their application. The distance between the shoulder and the underside of the head cannot be prevented from being larger than the thickness of the support member. This can cause the grommet, when under a load, to come loose from the support member. Besides, this

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endangers the water tightness, safe function, and freedom from rattling, which are required particularly for the manufacture of automobiles.

It is the object of the invention to improve an grommet of the aforementioned type with a view to producing an approximately equal distance or bias between the head of the grommet and the support member independently of the thickness of the sheet of the support member.

The object is attained by the features of claim 1.

In the inventive grommet, the outer surface portion is inclined towards the longitudinal axis in the direction of the head that when the shank is rotated in the opening it is increasingly drawn into the opening.

In the inventive grommet, a snapping chamfer is provided above the shoulders which cooperates with the edge of the receiving opening when the grommet is rotated in the opening. This chamfer is conical, i.e. inclined towards the head from the axis, in the invention. In this manner, when the grommet is rotated a bias into the receiving opening is applied to the shank as soon as the edge of the opening gets into engagement with the detent chamfer. Whatever the sheet thickness is, this will ensure that the head gets into engagement with the support member side facing it under a bias and produces a sufficient sealing action. Moreover, this ensures that the grommet, when under a tensile load, does not come loose from sheets of lesser thicknesses. In the inventive grommet, sufficient tightness is provided, which is a safety from undesirable chattering and clearance, whatever the sheet metal thickness is.

The detent chamfers or outer surface portions can be of a cambered or any other shape. They are planar, according to an aspect of the invention.

The invention is particularly advantageous when a square-shaped opening and a shank of the grommet having an approximately square cross-section are used. However, the invention is not limited to such contour, but can also be used, for

example, for an elliptic or oval receiving opening in the support member, and a shank complementary in cross-section.

In another aspect of the invention, the shoulders of the shank have their origin in a corner portion of the shank and extend towards an adjacent corner while they narrow continuously until they gradually run into the outer surface of the shank. The detent chamfer hereby starts preferably at the bottom of the shoulder and extends towards the head with the detent chamfer also ending with the respective shoulder in this aspect of the invention.

The invention will be described in more detail below with reference to an embodiment shown in the drawings.

Fig. 1 shows a side view of a grommet according to the invention, partially in a section,

Fig. 2 shows the grommet of Fig. 1 in a receiving opening of a sheet-like support member of a small thickness,

Fig. 3 shows the grommet of Fig. 1 in a receiving opening of a sheet-like support member of a larger thickness,

Fig. 4 shows a plan view of the grommet of Fig. 1 at an enlarged scale,

Fig. 5 shows the same representation of the grommet of Fig. 4, but with a contour drawn in for a receiving opening in a sheet-like support.

A grommet 10 of Figs. 1 to 5 has a shank 12 which exhibits a conical insertion end 14 for the placement in a receiving opening of a sheet-like support member, reference to which will be made farther below.

A head 16 is formed with the shank 12 at the end opposing the insertion end 14. The head 16 is comprised of a radially inner portion 18 which is made of the same material as is the shank 12, and a radially outer portion 20 which is formed from a softer, elastomeric material. The grommet 10 is formed by a two-component injection moulding technique which is known per sé.

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The outer contour of the shank 12 is square in cross-section as is evident from Figs. 4 and 5. The shank 12 internally has an axial receiving bore 22 which also extends through the portion 18 of the head 16. A conical inserting portion 24 is formed in the area of the head portion 18. The receiving bore 22 serves for the reception of a member having a threaded portion which can be screwed into the bore 22 to fix another member.

Snapping lugs 26 are formed on two opposed sides of the shank 12 close to the head 16. In the area of the snapping lugs 26, the shank presents axially parallel through slots 28, 30 whereby the snapping lugs 26 are formed on a yielding wall portion. Besides, as can be seen in Figs. 1 to 3, the snapping lugs 26 are kept free by a U-shaped slot 30. Therefore, they can be radially deformed inwardly while being inserted into a receiving opening and, subsequently, snap back behind the edge of the receiving opening when the grommet 10 is introduced into the receiving opening as can be appreciated in Figs. 2 and 3.

Near the head 16, in all of the four corner portions, the shank 12 has shoulders 32 the surfaces of which extend to be approximately perpendicular to the axis of the shaft 12 and which start in the associated corner and extend towards an adjacent corner each as can be seen from Figs. 4 and 5. Their width is increasingly reduced thereby so that the shoulder surfaces 32 are of approximately triangular shapes.

The head 16 and the shoulders 32 have formed therebetween a surface portion 34 each which is inclined from the longitudinal axis of the shank 12 towards the head 16 as is apparent from Figs. 1 to 3. Each surface portion 34 extends upwards from the shoulder 32 and is of approximately the same width as this one as is obvious again from Figs. 4 and 5. The surface 34 is not only inclined upwardly with respect to the longitudinal axis of the shank 12, but also extends at an angle from the side edges of the square which is defined by the cross-section of the shank 12. This can also be seen well from Figs. 4 and 5.

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Figs. 2 and 3 illustrate a support member 36, 38 of different thicknesses which has a receiving opening each 40 and 42 which have the same dimensions. It can be appreciated from Fig. 3 that the support member 36 nearly fills the space between the shoulder 32 and the underside of the head 16 whereas relatively much space remains vacant in the embodiment of Fig. 2.

It can be appreciated from Fig. 5 that the shank 12 has been inserted into the receiving opening 40 while having been rotated clockwise about a small angle. At this point, the shoulders 32 are located at the underside of the support member 36 as can be recognized from Fig. 2 and the edge of the opening 40 is in engagement with the surface portions 34. As a result, because of the inclination and conicity of the surface portions 34, the shank 12 is increasingly drawn into the opening 40 so that the head 16 comes to bear on the support member 36 in an ideal case although the support member 36 is relatively thin. The bias produced deforms the outer portion 20 of the head 16, which is conical in a relaxed condition, in a radially outward direction so as to sealingly bear against the surface of the support member 36 that faces it.

The same effect is obtained also on a thicker support member 38 of Fig. 3 with the shank 12, however, being rotated about a markedly smaller angle in the opening 42 until the increased bias is achieved again between the head 16 and the support member 38.

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